REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED

REV																				
SHEET																				
REV																				
SHEET	15	16	17	18	19															
REV STATUS				REV																
OF SHEETS				SHEET			1	2	3	4	5	6	7	8	9	10	11	12	13	14

PMIC N/A

PREPARED BY
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STANDARD MICROCIRCUIT DRAWING

THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE

AMSC N/A

CHECKED BY
Greg Cecil

APPROVED BY
Charles F. Saffle

DRAWING APPROVAL DATE
13-10-09

REVISION LEVEL

MICROCIRCUIT, HYBRID, LINEAR, SINGLE CHANNEL, DC-DC CONVERTER

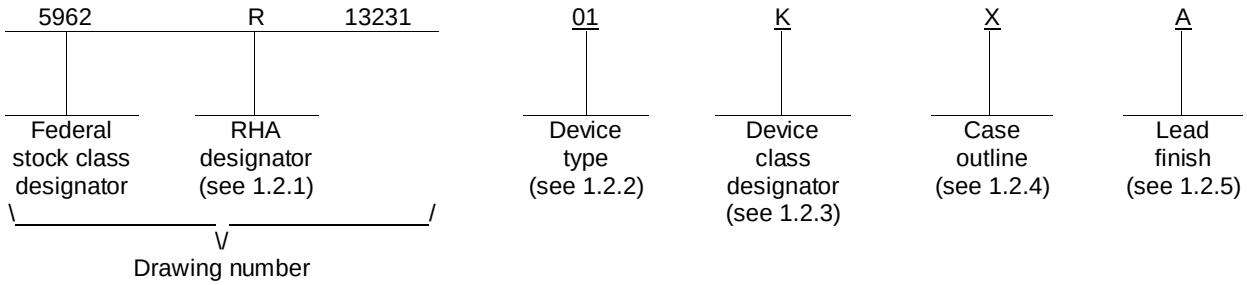
SIZE	CAGE CODE	
A	**67268**	**5962-13231**

SHEET 1 OF 19

1. SCOPE

1.1 Scope. This drawing documents five product assurance classes as defined in paragraph 1.2.3 and MIL-PRF-38534. A choice of case outlines and lead finishes which are available and are reflected in the Part or Identifying Number (PIN). When available, a choice of radiation hardness assurance levels are reflected in the PIN.

1.2 PIN. The PIN shall be as shown in the following example:



1.2.1 Radiation hardness assurance (RHA) designator. RHA marked devices shall meet the MIL-PRF-38534 specified RHA levels and shall be marked with the appropriate RHA designator. A dash (-) indicates a non-RHA device.

1.2.2 Device type(s). The device type(s) identify the circuit function as follows:

Device type	Generic number	Circuit function
01	SVRHF283R3S	DC-DC Converter, 10 W, +3.3 V Output
02	SVRHF2805S	DC-DC Converter, 15 W, +5 V Output
03	SVRHF2812S	DC-DC Converter, 15 W, +12 V Output
04	SVRHF2815S	DC-DC Converter, 15 W, +15 V Output

1.2.3 Device class designator. This device class designator shall be a single letter identifying the product assurance level. All levels are defined by the requirements of MIL-PRF-38534 and require QML Certification as well as qualification (Class H, K, and E) or QML Listing (Class G and D). The product assurance levels are as follows:

Device class	Device performance documentation
K	Highest reliability class available. This level is intended for use in space applications.
H	Standard military quality class level. This level is intended for use in applications where non-space high reliability devices are required.
G	Reduced testing version of the standard military quality class. This level uses the Class H screening and In-Process Inspections with a possible limited temperature range, manufacturer specified incoming flow, and the manufacturer guarantees (but may not test) periodic and conformance inspections (Group A, B, C, and D).
E	Designates devices which are based upon one of the other classes (K, H, or G) with exception(s) taken to the requirements of that class. These exception(s) must be specified in the device acquisition document; therefore the acquisition document should be reviewed to ensure that the exception(s) taken will not adversely affect system performance.
D	Manufacturer specified quality class. Quality level is defined by the manufacturers internal, QML certified flow. This product may have a limited temperature range.

1.2.4 Case outline(s). The case outline(s) are as designated in MIL-STD-1835 and as follows:

Outline letter	Descriptive designator	Terminals	Package style
X	See figure 1	8	Dual-in-line
Y	See figure 1	8	Dual-in-line Flange mount

1.2.5 Lead finish. The lead finish shall be as specified in MIL-PRF-38534.

1.3 Absolute maximum ratings. 1/

Input Voltage (Continuous)	37.5 V dc
Input Voltage (Transient, 1 second)	50 V dc
Junction Temperature Rise to Case	+14 °C
Storage Temperature	-65 °C to +150 °C
Lead Solder Temperature (10 seconds)	+270 °C

1.4 Recommended operating conditions.

Input Voltage Range	+18 V dc to +37.5 V dc
Case Operating Temperature Range (T_C)	-55°C to +125 °C

1.5 Radiation features. 2/

Maximum total dose available (dose rate = 30 - 300 rads(Si)/s)	100 krads(Si) 3/
Maximum total dose available (dose rate ≤ 10 mrads(Si)/s)	100 krads(Si) 4/ 5/
Neutron Irradiation (1 MeV equivalent neutrons)	$1x10^{12}$ n/cm^2 6/
Single event phenomenon (SEP) effective linear energy transfer (LET):	
No SEL, SEB, SEGR	≤ 85 MeV-cm^2/mg 7/
SEU, SEFI	≤ 85 MeV-cm^2/mg 8/

2. APPLICABLE DOCUMENTS

2.1 Government specification, standards, and handbooks. The following specification, standards, and handbooks form a part of this drawing to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-PRF-19500 - Semiconductor Devices, General Specification for.
MIL-PRF-38534 - Hybrid Microcircuits, General Specification for.
MIL-PRF-38535 - Integrated Circuits (Microcircuits) Manufacturing, General Specification for.

1/ Stresses above the absolute maximum ratings may cause permanent damage to the device. Extended operation at the maximum levels may degrade performance and affect reliability.
2/ See 4.3.5 for the manufacturer's radiation hardness assurance analysis and testing.
3/ A representative device has been tested using Condition C (30-300 rads(Si)/s) of Method 1019 to100 krads(Si) to ensure Radiation Hardness Assurance designator level "R." A representative device will be re-tested after design or process changes that may affect the RHA response of this device.
4/ The bipolar, BiCMOS, linear and mixed signal semiconductor elements have been High Dose Rate tested using Condition A (50-300 rads(Si)/s) or Condition C (30-300 rads(Si)/s) and Low Dose Rate tested using Condition D of Method 1019 of MIL-STD-883 to 100 krads(Si).
5/ The linear bipolar and Bi/CMOS integrated circuit elements did not exhibit Enhanced Low Dose Rate Sensitivity (ELDRS) per the procedures for characterization per paragraph 3.13.1.1 of method 1019 in MIL-STD-883. Note: The PWM element had 8 samples for LDR tested to150 krads(Si) (1.5X) with all parameters meeting pre-radiation limits. Element will be re-tested after design or process changes that can affect the RHA response of the element.
6/ The linear bipolar integrated circuit and bipolar semiconductor components are tested per method 1017 of MIL-STD-883 using a minimum sample size of (5) devices.
7/ Representative samples were tested and no Gate Ruptures, Latch-up or Burn-out were exhibited to the limit specified. See table IB.
8/ Single event upsets (transient voltages) were exhibited to the limit specified and Single Event Functional Interrupts (shutdowns) occurred only under limited conditions.

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-883 - Test Method Standard Microcircuits.
MIL-STD-1835 - Interface Standard for Electronic Component Case Outlines.

DEPARTMENT OF DEFENSE HANDBOOKS

MIL-HDBK-103 - List of Standard Microcircuit Drawings.
MIL-HDBK-780 - Standard Microcircuit Drawings.

(Copies of these documents are available online at http://quicksearch.dla.mil or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2 Non-Government publications. The following documents form a part of this document to the extent specified herein.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM F 1192 - Standard Guide for the Measurement of Single Event Phenomena (SEP) Induced by Heavy Ion Irradiation of Semiconductor Devices.

2.3 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Item requirements. The individual item performance requirements for device classes D, E, G, H, and K shall be in accordance with MIL-PRF-38534. Compliance with MIL-PRF-38534 may include the performance of all tests herein or as designated in the device manufacturer's Quality Management (QM) plan or as designated for the applicable device class. The manufacturer may eliminate, modify or optimize the tests and inspections herein, however the performance requirements as defined in MIL-PRF-38534 shall be met for the applicable device class. In addition, the modification in the QM plan shall not affect the form, fit, or function of the device for the applicable device class.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-PRF-38534 and herein.

3.2.1 Case outline(s). The case outline(s) shall be in accordance with 1.2.4 herein and figure 1.

3.2.2 Terminal connections. The terminal connections shall be as specified on figure 2.

3.2.3 Radiation exposure circuits. The radiation exposure circuits shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing and acquiring activity upon request.

3.3 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in table IA and shall apply over the full specified operating temperature range.

3.4 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table II. The electrical tests for each subgroup are defined in table IA.

3.5 Marking of device(s). Marking of device(s) shall be in accordance with MIL-PRF-38534. The device shall be marked with the PIN listed in 1.2 herein. In addition, the manufacturer's vendor similar PIN may also be marked.

3.6 Data. In addition to the general performance requirements of MIL-PRF-38534, the manufacturer of the device described herein shall maintain the electrical test data (variables format) from the initial quality conformance inspection group A lot sample, for each device type listed herein. Also, the data should include a summary of all parameters manually tested, and for those which, if any, are guaranteed. This data shall be maintained under document revision level control by the manufacturer and be made available to the preparing activity (DLA Land and Maritime-VA) upon request.

3.7 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to supply to this drawing. The certificate of compliance (original copy) submitted to DLA Land and Maritime-VA shall affirm that the manufacturer's product meets the performance requirements of MIL-PRF-38534 and herein.

3.8 Certificate of conformance. A certificate of conformance as required in MIL-PRF-38534 shall be provided with each lot of microcircuits delivered to this drawing.

4. VERIFICATION

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-PRF-38534 or as modified in the device manufacturer's Quality Management (QM) plan. The modification in the QM plan shall not affect the form, fit, or function as described herein.

4.2 Screening. Screening shall be in accordance with MIL-PRF-38534. The following additional criteria shall apply:

a. Burn-in test, method 1015 of MIL-STD-883.

(1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to either DLA Land and Maritime-VA or the acquiring activity upon request. Also, the test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in method 1015 of MIL-STD-883.

(2) T_A as specified in accordance with table IA of method 1015 of MIL-STD-883.

b. Interim and final electrical test parameters shall be as specified in table II herein, except interim electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

c. PIND testing, method 2020, condition A, of MIL-STD-883.

TABLE IA. Electrical performance characteristics.

Test	Symbol	Conditions 1/ 2/ 3/ 4/ 5/ 6/ $-55°C \le T_C \le +125°C$ V_{IN} = +28 V dc ± 5% Full Load unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Output Voltage	$+V_{OUT}$	I_{OUT} = 3 A	1	01	3.267	3.333	V dc
			2,3		3.25	3.35	
		I_{OUT} = 3 A	1	02	4.95	5.05	
			2,3		4.9	5.1	
		I_{OUT} = 1.25 A	1	03	11.88	12.12	
			2,3		11.7	12.3	
		I_{OUT} = 1 A	1	04	14.85	15.15	
			2,3		14.63	15.37	
Output Current 7/	I_{OUT}	V_{IN} = 18 V dc to 37.5 V dc	1,2,3	01,02		3	A
				03		1.25	
				04		1	
V_{OUT} Ripple Voltage	V_{RIP}	BW = 20 Hz to 10 MHz	1,2,3	01,02		200	mVp-p
				03		120	
				04		150	
V_{OUT} Line Regulation	VR_{LINE}	V_{IN} = 18 V dc to 37.5 V dc	1,2,3	All		10	mV
V_{OUT} Load Regulation	VR_{LOAD}	No Load to Full Load	1,2,3	01,02		50	mV
				03,04		30	
Input Current	I_{IN}	I_{OUT} = 0, Inhibit (Pin 1) = 0	1,2,3	All		8	mA
		I_{OUT} = 0, Inhibit (Pin 1) = open		01,02		65	
				03		85	
				04		100	
I_{IN} Ripple Current	I_{RIP}	BW = 20 Hz to 10 MHz	1,2,3	01		150	mAp-p
				02		200	
				03		260	
				04		240	
Efficiency	Eff	I_{OUT} = 3 A	1,2,3	01	67		%
		I_{OUT} = 3 A		02	72		
		I_{OUT} = 1.25 A		03	76		
		I_{OUT} = 1 A		04	79		

See footnotes at end of table.

TABLE IA. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ 2/ 3/ 4/ 5/ 6/ -55°C ≤ T_C ≤+125°C V_{IN} = +28 V dc ± 5% Full Load unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Isolation	ISO	500 V dc, T_C = +25°C	1	All	100		MΩ
Capacitive Load 8/	C_L	No effect on DC performance, T_C = +25°C	1	01,02		500	µF
				03,04		300	
Short Circuit Power Dissipation	P_D	Short Circuit	1,2,3	All		8	W
Switching Frequency	F_S		1,2,3	All	350	500	kHz
V_{OUT} Step Load Transient	V_{TLOAD}	50% Load to 100% Load	4,5,6	01		250	mV pk
				02		250	
				03		600	
				04		700	
V_{OUT} Step Load Transient Recovery 9/	TT_{LOAD}	50% Load to 100% Load	4,5,6	All		350	µs
V_{OUT} Step Line Transient 8/	V_{TLINE}	V_{IN} = 18 V dc to 37.5 V dc	4,5,6	01		280	mV pk
				02		320	
				03,04		600	
V_{OUT} Step Line Transient Recovery 8/ 9/	TT_{LINE}	V_{IN} = 18 V dc to 37.5 V dc	4,5,6	01		520	µs
				02		340	
				03,04		400	
Start Up Overshoot	$Vton_{OS}$	V_{IN} = 0 V dc to 28 V dc	4,5,6	01		15	mV pk
				02		25	
				03,04		50	
Start Up Delay	Ton_D	V_{IN} = 0 V dc to 28 V dc	4,5,6	All		20	ms

See footnotes at end of table.

TABLE IA. Electrical performance characteristics - Continued.

1/ End-of-Life performance meets standard datasheet limits unless specific End-of-life limits are given.
2/ Post irradiation testing shall be in accordance with 4.3.5 herein.
3/ A representative device has been tested using Condition C (30-300 rads(Si)/s) of Method 1019 to100 krad(Si) to ensure RHA designator level "R" for +25°C parameters except as otherwise noted. A representative device will be re-tested after design or process changes that may affect the RHA response of these devices.
4/ The bipolar, BiCMOS, linear and mixed signal semiconductor elements have been HDR tested using Condition A (50-300 rads(Si)/s or C (30-300 rads(Si)/s) and LDR using Condition D of Method 1019 of MIL-STD-883 to100Krad (Si). The elements did not exhibit enhanced low dose rate sensitivity (ELDRS) per the procedures for characterization per paragraph 3.13.1.1, of method 1019 in MIL-STD-883. Note: The PWM element had 8 samples for LDR tested to 150 krad(Si) (1.5X) with all parameters meeting pre-radiation limits. Element will be re-tested after design or process changes that may affect the RHA response of the element.
5/ End-of-life performance not tested. Performance guaranteed to meet stated limits by worst-case analysis, which includes radiation and aging effects.
6/ Derate linearly to 0 at 135°C.
7/ Up to 60 percent of the total power or current can be drawn from any one of the two outputs.
8/ Parameter shall be tested as part of device characterization and after design and process changes. Thereafter, parameters shall be guaranteed to the limits specified in table I.
9/ Time for V_{OUT} to settle within ±1 percent of its final value.

TABLE IB. SEP test limits. 1/ 2/

Device types	SEP	Temperature (T_C)	Conditions/Results	Effective linear energy transfer (LET)
01,02,03,04	SEU	+25°C	Transients • Threshold LET > 8.3 MeV-cm^2/mg • Cross section at 85 MeV-cm^2/mg = 4.65 x 10^{-4} cm^2 • Peak magnitude <10% of nominal V_{out} with no external capacitance • Recovery < 0.4 msec • External capacitance reduces magnitude	85 MeV-cm^2/mg
01,02,03,04	SEFI	+25°C	Shut down/ Restarts • Restarts in less than 1 second • Threshold LET > 44 MeV-cm^2/mg • Cross section at 85 MeV-cm^2/mg = 3.18 x 10^{-6} cm^2	85 MeV-cm^2/mg
01,02,03,04	SEL	+125°C	Destructive – None Non Destructive 3/ • Output decays to 0 V • Duration > 1 second • May restart autonomously • May require inhibit cycle or power cycle to recover • Threshold LET > 44 MeV-cm^2/mg • Cross section at 85 MeV-cm^2/mg is = 3.18 x 10^{-6} cm^2	85 MeV-cm^2/mg
01,02,03,04	SEB	+25°C	None	85 MeV-cm^2/mg
01,02,03,04	SEGR	+25°C	None	85 MeV-cm^2/mg

1/ For SEP test conditions, see 4.3.5.1.1.3 herein.
2/ See manufacturer for complete SEP reports on this and similar devices for more information.
3/ The shutdowns are caused by the PWM control IC. The PWM IC shutdown response was separated into two categories SEFI for self- recovering shutdowns < 1 second in duration and nondestructive SEL for events > 1 second in duration or that require an inhibit pin cycle to recover. The cross sections given are for total number of combined events (SEFI and SEL) at 125 ºC, which is the worst case condition.

Case outline X.

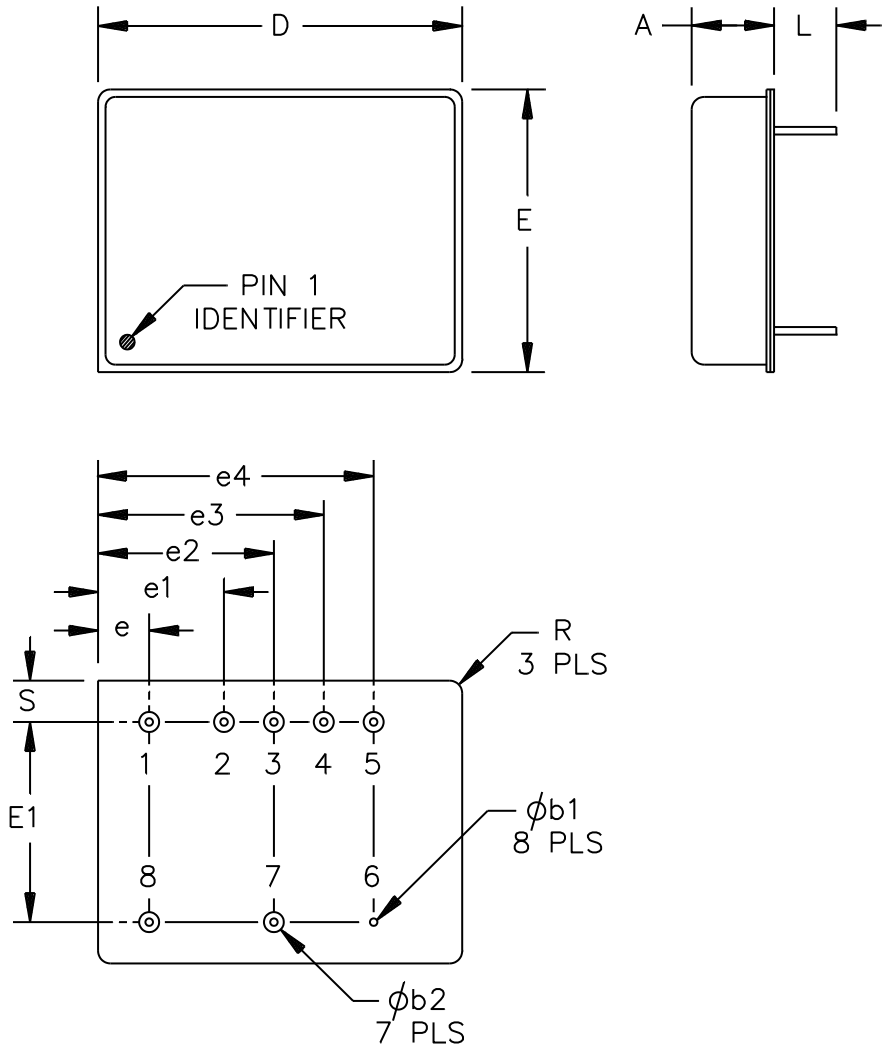


FIGURE 1. Case outline.

Case outline X - Continued.

Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	-	8.38	-	.330
øb1	.71	.81	0.028	0.032
øb2	1.98	2.08	0.078	0.082
D	-	37.08	-	1.460
E	-	28.70	-	1.130
E1	20.19	20.45	.795	.805
e	5.08	5.33	.200	.210
e1	12.70	12.95	.500	.510
e2	17.78	18.03	.700	.710
e3	22.86	23.11	.900	.910
e4	27.94	28.19	1.10	1.11
L	5.97	6.73	.235	.265
R	1.14	1.40	.045	.055
S	3.94	4.19	.155	.165

NOTES:
1. The U. S. Government preferred system of measurement is the metric SI. This item was designed using inch-pound units of measurement. In case of problems involving conflicts between the metric and inch-pound units, the inch-pound units shall take precedence.
2. Pin numbers are for reference only.
3. Case outline X weight: 24 grams maximum.

FIGURE 1. Case outline – Continued.

Case outline Y.

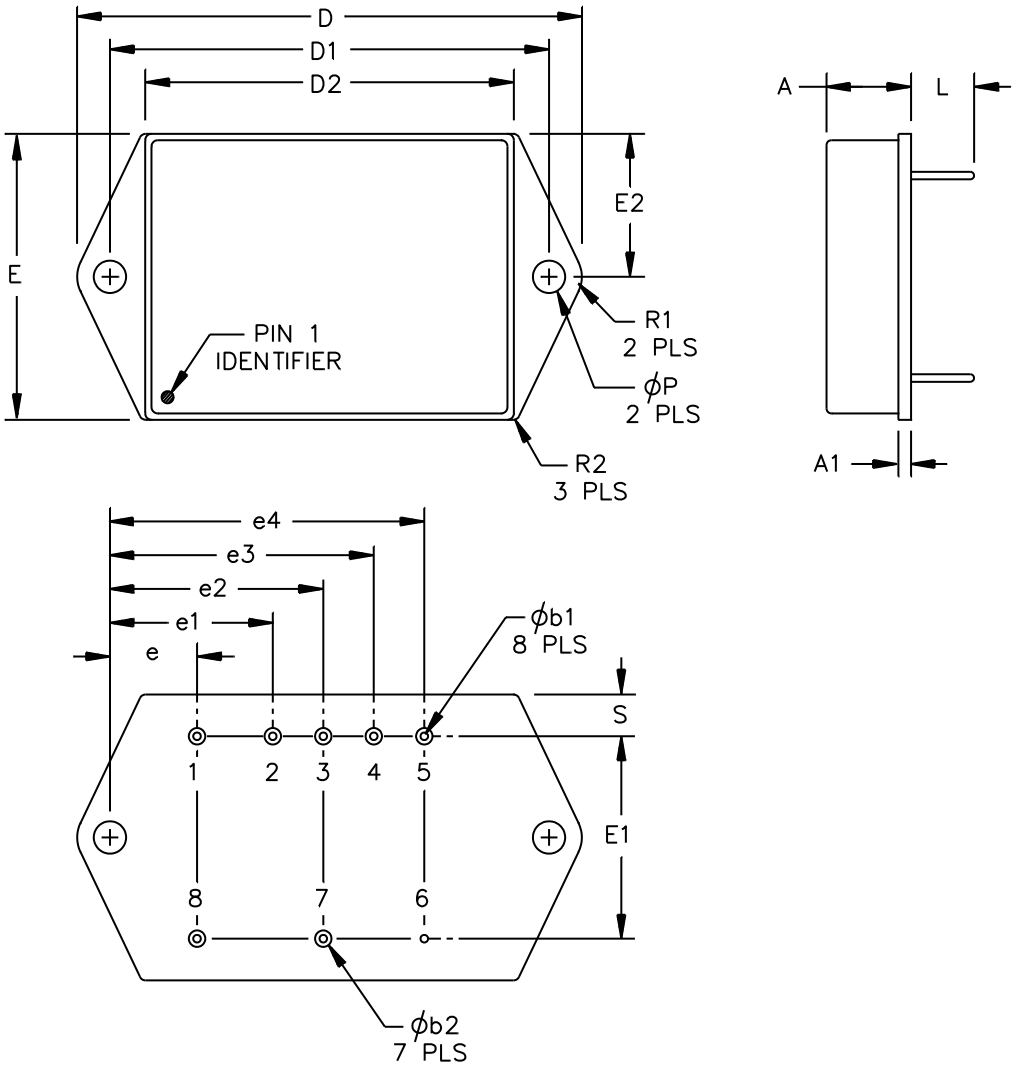


FIGURE 1. Case outline(s). – Continued

Case outline Y - Continued.

Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	-	9.02	-	.355
A1	1.07	1.27	.042	.050
øb1	0.71	0.81	.028	.032
øb2	1.98	2.08	.078	.082
D	-	50.80	-	2.00
D1	43.82	44.07	1.725	1.735
D2	-	37.08	-	1.460
e	8.64	8.89	.340	.350
e1	16.26	16.51	.640	.650
e2	21.34	21.59	.840	.850
e3	26.42	26.67	1.040	1.050
e4	31.50	31.75	1.240	1.250
E	-	28.70	-	1.130
E1	20.19	20.45	.795	.805
E2	14.10	14.35	.555	.565
øP	3.12	3.38	.123	.133
L	5.97	6.73	.235	.265
R1	3.18	3.43	.125	.135
R2	1.14	1.40	.045	.055
S	3.94	4.19	.155	.165

NOTES:
1. The U. S. Government preferred system of measurement is the metric SI. This item was designed using inch-pound units of measurement. In case of problems involving conflicts between the metric and inch-pound units, the inch-pound units shall take precedence.
2. Pin numbers are for reference only.
3. Case outline Y weight: 27 grams maximum.

FIGURE 1. Case outline(s). - Continued

Device types	All
Case outline	X, Y
Terminal numbers	Terminal symbols
1	Inhibit
2	N/C
3	OUT common
4	$+V_{OUT}$
5	N/C
6	Case
7	IN Common
8	28 V IN

FIGURE 2. Terminal connections.

TABLE II. Electrical test requirements.

MIL-PRF-38534 test requirements	Subgroups (in accordance with MIL-PRF-38534, group A test table)
Interim electrical parameters	1, 2, 3, 4, 5, 6
Final electrical parameters	1*, 2, 3, 4, 5, 6
Group A test requirements	1, 2, 3, 4, 5, 6
Group C end-point electrical parameters	1, 2, 3, 4, 5, 6
End-point electrical parameters for radiation hardness assurance (RHA) devices	1, 4

* PDA applies to subgroup 1.

4.3 Conformance and periodic inspections. Conformance inspection (CI) and periodic inspection (PI) shall be in accordance with MIL-PRF-38534 and as specified herein.

4.3.1 Group A inspection (CI). Group A inspection shall be in accordance with MIL-PRF-38534 and as follows:

a. Tests shall be as specified in table II herein.

b. Subgroups 7, 8, 9, 10, and 11 shall be omitted.

4.3.2 Group B inspection (PI). Group B inspection shall be in accordance with MIL-PRF-38534.

4.3.3 Group C inspection (PI). Group C inspection shall be in accordance with MIL-PRF-38534 and as follows:

a. End-point electrical parameters shall be as specified in table II herein.

b. Steady-state life test, method 1005 of MIL-STD-883.

(1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to either DLA Land and Maritime-VA or the acquiring activity upon request. Also, the test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in method 1005 of MIL-STD-883.

(2) T_A as specified in accordance with table I of method 1005 of MIL-STD-883.

(3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

4.3.4 Group D inspection (PI). Group D inspection shall be in accordance with MIL-PRF-38534.

4.3.5. Radiation hardness assurance (RHA). RHA qualification is required only for those devices with the RHA designator as specified herein. See table IIIA and IIIB.

Table IIIA. Radiation Hardness Assurance Methods Table.

RHA method Employed	Active elements tested only as part of the hybrid device.	Rated total dose (100 krad(Si))		Worst Case Analysis Performed				End points tests after final total dose	
		Element Level	Hybrid Device Level	Includes temperature effects	Combines temperature and radiation effects	Combines total dose and displacement effects	End-of-life	Element Level	Hybrid device level
	No	Tested at 1X	Tested at 1X	Yes	Yes	Yes	1/ Yes	T_C = +25ºC	T_C = +25ºC

1/ Worst case analysis performed with case temperatures from -55ºC to +85ºC.

Table IIIB. Hybrid level and element level test table.

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VPT SVRHF	Radiation test				
SMD 5962-13231	Total Dose			Heavy Ion	Neutron
Hybrid Level Testing	Low Dose Rate	High Dose Rate (HDR)	ELDRS Characterization	SEP	Displacement Damage (DD)
	Not tested	Tested (100 krads)	No	Tested (85 MeV-cm^2/mg)	Not tested
Element Level Testing					
CMOS Discrete (Power MOSFET)	N/A	Tested (100 krads)	N/A	Tested (hybrid level test)	Not tested
Bipolar Discrete Devices	Not tested	Tested (100 krads)	Not tested	Tested (hybrid level test)	Tested ($1x10^{12}$)
Bipolar Linear or Mixed Signal > 90 nm	Tested (100 krads)	Tested (100 krads)	Tested	Tested (hybrid level test)	Tested ($1x10^{12}$)

4.3.5.1 Radiation Hardness Assurance (RHA) inspection. RHA qualification is required for those devices with the RHA designator as specified herein. End-point electrical parameters for radiation hardness assurance (RHA) devices shall be specified in table II. Radiation testing will be in accordance with the qualifying activity (DLA Land and Maritime-VQ) approved plan and with MIL-PRF-38534, Appendix G.

a. The hybrid device manufacturer shall establish procedures controlling element radiation testing, and shall establish radiation test plans used to implement element lot qualification during procurement. Test plans and test reports shall be filed and controlled in accordance with the manufacturer's configuration management system.

b. The hybrid device manufacturer shall designate a RHA program manager to oversee element lot qualification, and to monitor design changes for continued compliance to RHA requirements.

4.3.5.1.1 Hybrid level radiation qualification.

4.3.5.1.1.1 Qualification by similarity. A family is defined by the family model designator e.g. SVRHF single/dual. All parts with this designator share a common design and use the same active elements. The SVRHF single 3.3, 5, 12 and 15 volt per this SMD, and the SVRHF dual 5, 12, and 15 volt per 5962-13232 are considered similar for the purpose of radiation testing. Device types 5962R1323102HXC and 5962R1323203HXC were tested for both TID at HDR and SEP, except SEL (see 4.3.5.1.1.3.e), and all other devices on both SMDs are RHA qualified by similarity.

4.3.5.1.1.2 Total ionizing dose irradiation testing. A minimum of two devices of one representative hybrid of the hybrid family (family model designator, e.g. SVRHF Single) is characterized and tested initially and after any design or process changes which may affect the RHA response of the device type. Devices are tested at High Dose Rate (HDR) in accordance with condition C (dose rate of 30-300 rads(Si)/s) of method 1019 of MIL-STD-883 to 100 krads(Si). The minimum sample size of 2 will consist of 1 biased and 1 unbiased.

4.3.5.1.1.3 Single event phenomena (SEP). A minimum of one representative hybrid of the hybrid family is characterized for SEE response at initial qualification and after any design or process change which may affect the RHA response of the device type. Testing shall be performed in accordance with ASTM F1192. Test conditions for SEP are as follows:

a. The ion beam angle of incidence shall be normal to the die surface. No shadowing of the ion beam due to fixturing is allowed.

b. The fluence shall be $\geq 1x10^7$ particles/cm^2.

c. The flux shall be between 10^2 and 10^5 ions/cm^2/s.

d. The particle range shall be $\geq$ 35 micron in silicon.

e. The characterization is performed at nominal input voltage, and with both minimum and maximum load. The test temperature shall be +25ºC ±10 ºC in air, except latch-up which is at +125ºC ±10 ºC in air. Note: Hybrid level SEL testing is not performed if all elements have been SEL tested previously.

f. For SEP test limits, see table IB herein.

4.3.5.1.2 Element level radiation qualification

4.3.5.1.2.1 Technologies not being tested. Testing is not performed on device technologies including: Junction Diodes, Schottky and zener diodes that the manufacturer determines to be radiation hardened.

4.3.5.1.2.2 Total Ionizing Dose Irradiation. The manufacturer employs two methods of addressing TID.

a. QML die. Active Elements that are purchased as level R MIL-PRF-38535 Standard Microcircuit Drawing (SMD) or MIL-PRF-19500 JAN where the electrical performance meets those established for the elements at hybrid device design. Bipolar/BiCMOS linear or mixed signal integrated circuit elements additionally require that the SMD specify LDR of 100KRad(Si) or LDR testing be performed as described in b. below.

b. Non QML die. Five biased and five unbiased samples from each initial wafer lot of active elements, except as noted in 4.3.5.1.2.1, will be characterized and tested at HDR in accordance with condition C (dose rate of 30-300 Rads(Si)/s) of method 1019 of MIL-STD-883 to100Krad(Si). Bipolar/BiCMOS linear or mixed signal semiconductor elements will additionally have five biased and five unbiased samples from each initial wafer lot characterized and tested at LDR in accordance with condition D of method 1019 of MIL-STD-883 to 100Krad(Si). Element parametric degradation for both HDR and LDR test results are analyzed using 0.9900/90% statistics and compared to limits established for the elements at hybrid device design. The criteria of Method 1019 paragraph 3.13.1.1 is applied to determine if there is a low dose rate affect (ELDRS).

4.3.5.1.2.3 Neutron Irradiation. Every initial wafer lot of bipolar linear or mixed signal integrated circuits and semiconductor elements will be tested to minimum average integrated neutron fluence (1 MeV Si equivalent) of 1×10^{12} n/cm^2 in accordance with method 1017 of MIL-STD-883 using a minimum sample size of 5 samples. MIL-STD-883 method 1017 requires 10 samples. 0.9900/90% statistics are applied to the element parameter degradations which are compared against limits established for the element at hybrid device design.

4.3.5.2 Radiation lot Acceptance. Each wafer lot of active elements shall be evaluated for acceptance in accordance with MIL-PRF-38534 and herein.

4.3.5.2.1 Total Ionizing Dose Irradiation. The manufacturer employs two methods of addressing TID.

a. QML die. Active Elements that are purchased as level R MIL-PRF-38535 (SMD) Standard Microcircuit Drawing or MIL-PRF-19500 JAN where the electrical performance meets those established for the element at hybrid device design.

b. Non QML die. Five biased and five unbiased samples from each wafer lot of active elements, except as noted in 4.3.5.1.2.1, will be characterized and tested at HDR in accordance with condition C (dose rate of 30-300 Rads(Si)/s) of method 1019 of MIL-STD-883 to100Krad(Si). 0.9900/90% statistics are applied to the element parameter degradations which are compared against limits established for the element at hybrid device design.

4.3.5.2.2 Neutron Irradiation. Every wafer lot of bipolar linear or mixed signal integrated circuit and semiconductor elements, except those purchased as MIL-PRF-38535 (SMD) Standard Microcircuit Drawing or MIL-PRF-19500 JAN will be tested to minimum average integrated neutron fluence (1 MeV Si equivalent) of 1×10^{12} n/cm^2 in accordance with method 1017 of MIL-STD-883 using a minimum sample size of 5 samples. MIL-STD-883 method 1017 requires 10 samples. 0.9900/90% statistics are applied to the element parameter degradations which are compared against limits established for the elements at hybrid device design.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-PRF-38534.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use for Government microcircuit applications (original equipment), design applications, and logistics purposes.

6.2 Replaceability. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.

6.3 Configuration control of SMD's. All proposed changes to existing SMD's will be coordinated as specified in MIL-PRF-38534.

6.4 Record of users. Military and industrial users shall inform DLA Land and Maritime when a system application requires configuration control and the applicable SMD. DLA Land and Maritime will maintain a record of users and this list will be used for coordination and distribution of changes to the drawings. Users of drawings covering microelectronic devices (FSC 5962) should contact DLA Land and Maritime-VA, telephone (614) 692-8108.

6.5 Comments. Comments on this drawing should be directed to DLA Land and Maritime-VA, Columbus, Ohio 43218-3990, or telephone (614) 692-1081.

6.6 Sources of supply. Sources of supply are listed in MIL-HDBK-103 and QML-38534. The vendors listed in MIL-HDBK-103 and QML-38534 have submitted a certificate of compliance (see 3.7 herein) to DLA Land and Maritime-VA and have agreed to this drawing.

6.7 Additional information. When applicable, a copy of the following additional data shall be maintained and available from the device manufacturer:

a. RHA upset levels.

b. Test conditions (SEP).

c. Occurrence of latchup (SEP).

d Occurrence of Burn-out (SEP).

e. Occurrence of Gate Rupture (SEP).

f. Occurrence of Single Event Functional Interrupt (SEP).

g Occurrence of Single Event Upset (SEP).

STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 13-10-09

Approved sources of supply for SMD 5962-13231 are listed below for immediate acquisition information only and shall be added to MIL-HDBK-103 and QML-38534 during the next revisions. MIL-HDBK-103 and QML-38534 will be revised to include the addition or deletion of sources. The vendors listed below have agreed to this drawing and a certificate of compliance has been submitted to and accepted by DLA Land and Maritime-VA. This information bulletin is superseded by the next dated revisions of MIL-HDBK-103 and QML-38534. DLA Land and Maritime maintains an online database of all current sources of supply at http://www.landandmaritime.dla.mil/Programs/Smcr/.

Standard microcircuit drawing PIN 1/	Vendor CAGE number	Vendor similar PIN 2/
5962R1323101HXC	0ZBZ6	SVRHF283R3S/H+
5962R1323101HXA	0ZBZ6	SVRHF283R3S/H+-E
5962R1323101HYC	0ZBZ6	SVRHF283R3SF/H+
5962R1323101HYA	0ZBZ6	SVRHF283R3SF/H+-E
5962R1323101KXC	0ZBZ6	SVRHF283R3S/K
5962R1323101KXA	0ZBZ6	SVRHF283R3S/K-E
5962R1323101KYC	0ZBZ6	SVRHF283R3SF/K
5962R1323101KYA	0ZBZ6	SVRHF283R3SF/K-E
5962R1323102HXC	0ZBZ6	SVRHF2805S/H+
5962R1323102HXA	0ZBZ6	SVRHF2805S/H+-E
5962R1323102HYC	0ZBZ6	SVRHF2805SF/H+
5962R1323102HYA	0ZBZ6	SVRHF2805SF/H+-E
5962R1323102KXC	0ZBZ6	SVRHF2805S/K
5962R1323102KXA	0ZBZ6	SVRHF2805S/K-E
5962R1323102KYC	0ZBZ6	SVRHF2805SF/K
5962R1323102KYA	0ZBZ6	SVRHF2805SF/K-E
5962R1323103HXC	0ZBZ6	SVRHF2812S/H+
5962R1323103HXA	0ZBZ6	SVRHF2812S/H+-E
5962R1323103HYC	0ZBZ6	SVRHF2812SF/H+
5962R1323103HYA	0ZBZ6	SVRHF2812SF/H+-E
5962R1323103KXC	0ZBZ6	SVRHF212S/K
5962R1323103KXA	0ZBZ6	SVRHF2812S/K-E
5962R1323103KYC	0ZBZ6	SVRHF2812SF/K
5962R1323103KYA	0ZBZ6	SVRHF2812SF/K-E
5962R1323104HXC	0ZBZ6	SVRHF2815S/H+
5962R1323104HXA	0ZBZ6	SVRHF2815S/H+-E
5962R1323104HYC	0ZBZ6	SVRHF2815SF/H+
5962R1323104HYA	0ZBZ6	SVRHF2815SF/H+-E
5962R1323104KXC	0ZBZ6	SVRHF2815S/K
5962R1323104KXA	0ZBZ6	SVRHF2815S/K-E
5962R1323104KYC	0ZBZ6	SVRHF2815SF/K
5962R1323104KYA	0ZBZ6	SVRHF2815SF/K-E

1/ The lead finish shown for each PIN representing a hermetic package is the most readily available from the manufacturer listed for that part. If the desired lead finish is not listed contact the Vendor to determine its availability.

2/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.

Vendor CAGE number	Vendor name and address
0ZBZ6	VPT Incorporated 1971 Kraft Drive, Suite 1000 Blacksburg, VA 24060